



**CALIFORNIA
ENERGY COMMISSION**



California Energy Commission
Clean Transportation Program

FINAL PROJECT REPORT

Residential Electric Vehicle Supply Equipment (EVSE) Deployment Program in California's Multi-Unit Dwellings

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Prepared by: AeroVironment, Inc.



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Extended Stay America -- Hotels

AeroVironment Inc. (AV) wishes to acknowledge Extended Stay America, which participated in this program. Volunteering its time and buildings for this effort made possible the expansion of electric vehicle charging infrastructure in hotels in San Diego, California.

Car2Go Car Sharing Program

AV wishes to acknowledge Car2Go¹ for their efforts in assisting with site identification and integrating the Electric Vehicle (EV) charging hotel venues with their business operations in San Diego, California.

¹ [Car Sharing Application](https://www.car2go.com/US/en/) <https://www.car2go.com/US/en/>

PREFACE

Assembly Bill 118 (Núñez, Chapter 750, Statutes of 2007) created the Clean Transportation Program. The statute authorizes the CEC to develop and deploy alternative and renewable fuels and advanced transportation technologies to help attain the state's climate change policies. Assembly Bill 8 (Perea, Chapter 401, Statutes of 2013) reauthorizes the Clean Transportation Program through January 1, 2024, and specifies that the CEC allocate up to \$20 million per year (or up to 20 percent of each fiscal year's funds) in funding for hydrogen station development until at least 100 stations are operational.

The Clean Transportation Program has an annual budget of about \$100 million and provides financial support for projects that:

- Reduce California's use and dependence on petroleum transportation fuels and increase the use of alternative and renewable fuels and advanced vehicle technologies.
- Produce sustainable alternative and renewable low-carbon fuels in California.
- Expand alternative fueling infrastructure and fueling stations.
- Improve the efficiency, performance and market viability of alternative light-, medium-, and heavy-duty vehicle technologies.
- Retrofit medium- and heavy-duty on-road and nonroad vehicle fleets to alternative technologies or fuel use.
- Expand the alternative fueling infrastructure available to existing fleets, public transit, and transportation corridors.
- Establish workforce-training programs and conduct public outreach on the benefits of alternative transportation fuels and vehicle technologies.

To be eligible for funding under the Clean Transportation Program, a project must be consistent with the CEC's annual Clean Transportation Program Investment Plan Update. The CEC issued solicitation PON-11-602 to providing funding for AeroVironment Inc., residential electric vehicle supply equipment deployment program. In response to PON-11-602, the recipient submitted an application which was proposed for funding in the CEC's notice of proposed awards August 16, 2012. and the agreement was executed as ARV-12-016 on April 10, 2013

ABSTRACT

In early 2013, the CEC awarded grant funding of \$75,000 to AeroVironment Inc. to supply and install level 2 electric vehicle supply equipment installations, also called charging stations, at each of two Young Men's Christian Association facilities in San Diego for use by the associations' members, the public, and to support Car2Go operations. However, this association subsequently decided to withdraw participation from the program because of the requirement to allow non-member access (i.e., public charging and Car2Go operations). The contract was then modified to install electric vehicle supply equipment at two hotels in San Diego for use by hotel guests, Car2Go customers/operations, and the public.

After an extensive search for hotel sites for the electric vehicle supply equipment installations, Extended Stay America applied to participate under the program. AeroVironment Inc. sub-contracted with local electrical contractors to perform the installation work. electric vehicle supply equipment installations were performed from December 2015 to January 2016. Car2Go, initially in negotiations with Extended Stay America to allow Car2Go fleet customers to use the stations, made a drastic change in their fleet, moving from electric vehicles to gasoline-powered vehicles. The program was then simplified to allow for access to hotel guests and the public.

Governor Brown's Executive Order B-16-12 directs the state government to support and facilitate the rapid commercialization of zero-emission vehicles in California, with a target of 1.5 million zero-emission vehicles on California roads by 2025.

The primary goal of the project was to expand electric vehicle adoption in a particularly difficult sector for installation of electric vehicle infrastructure: multi-unit dwellings—in this case hotels were chosen for their long dwell-time attribute. The qualification process was lengthy because hotels had to be within the Car2Go service territory, have sufficient non-gated parking, and sufficient power availability.

The project exceeded its goals with the installation of eight electric vehicle supply equipment installations, four at each of the two Extended Stay America hotels. The project, in future years, will result in an estimated greenhouse gas emissions reduction of 11-metric tons annually and displacement of approximately 1,800 gallons of gasoline annually. It also expands public electric vehicle charging infrastructure in the City of San Diego.

Keywords: AeroVironment Inc., Extended Stay America Hotels, Young Men's Christian Association, Plug-in Electric Vehicles, Electric Vehicle Supply Equipment Installations, Greenhouse Gases, Regulated Emissions, and Energy Use in Transportation.

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EXECUTIVE SUMMARY

This report describes how AeroVironment Inc. worked with Car2Go to identify potential participating hotels, qualify them for the program, and supply and install level 2 electric vehicle supply equipment at Extended Stay America Fashion Valley and Hotel Circle hotels in San Diego. The electric vehicle supply equipment installed under this program can charge a wide spectrum of plug-in electric vehicles that include: Nissan LEAF™, Chevy Volt, Chevy Spark, BMW i3, Mercedes B Class, Mitsubishi Outlander and iMiEV vehicles, Toyota Prius plug-in hybrid, Ford Focus, Ford Fusion, Fiat 500e, Tesla Model S, Hyundai Sonata Plug-in Hybrid Electric Vehicle, Volvo XC90T8, Kia Soul, Honda Fit Electric Vehicle, and Honda Accord plug-in hybrid.

Late in the program, after the electric vehicle supply equipment installations had been installed at the Extended Stay America hotels, Car2Go made a dramatic change in their fleet, replacing their Daimler Smart electric vehicles to gasoline-powered Smart vehicles. The eight new electric vehicle supply equipment installations supplied and installed through this project in December 2015 and January 2016 were projected to log approximately 3,000 charging events per year, primarily from Car2Go use. With the Car2Go's shift in operations, the actual usage through the first six months of operation was much lower.

Based on the first six months of actual kilowatt-hour logged, the electricity dispensed by electric vehicle supply equipment installations to these plug-in electric vehicles would allow them to travel 3,300 miles per year. For future years this is expected to increase to 52,000 miles, which results in displacing an estimated 1,800 gallons of regular gasoline annually when compared to a 2013 sedan using regular unleaded fuel. This equates to an estimated annual greenhouse gas emissions reduction of 11 metric tons.

The goals of this project were to expand electric vehicle charging infrastructure at hotels and to support Car2Go's car sharing program in San Diego. These were achieved with the installation of eight level 2 electric vehicle supply equipment installations at the two Extended Stay America hotels. With the shift in Car2Go operations, these chargers are still available to hotel guests and the public.

This project demonstrates how electric vehicles can meet California's multi-unit dweller and public charging needs, thereby supporting widespread adoption. This project also assists the state to reduce its petroleum consumption and helps to reduce greenhouse gas emissions.

CHAPTER 1:

Objectives, Planning, and Approach

1.1 Project Overview – Goals and Objectives

The purpose of the project was to promote adoption of EV in the State of California and expand fleet charging in the State. The Problem Statement for the project was:

“According to the Department of Motor Vehicles², California leads the nation with approximately 89,000 EV on the road last year. But as more Plug-in Electric Vehicles (PEVs) are introduced into the market, the demand for supporting EV charging infrastructure accessible to the public needs to be met. This plan requires installation of the necessary electric charging infrastructure to support electric vehicle charging.”

Goals and Objectives

- Accelerate the commercialization of alternative vehicles and alternative/renewable fuels
EV adoption depends on the consumer and positive word-of-mouth relative to their experience. A primary project goal was to make the installation process of level 2 electric vehicle supply equipment installations process efficient and seamless.
- Reduce the use of petroleum fuels and greenhouse gas (GHG) emissions to help the state achieve its public policy goals

The degree of green GHG emission reduction attributable to EV depends on the grid generation mix. As California has high renewables penetration and high natural gas components in its grid generation mix, it is the ideal environment which makes EV effective at reducing GHG emissions from gasoline-powered vehicles. Through this program, consumer adoption of electric vehicles contributed to the reduction of GHG emissions in the San Diego area.

In 2006, California enacted the Global Warming Solutions Act 32³ to mitigate and reduce California’s GHG emissions. In 2012, Governor Brown issued Executive Order B-16-12⁴ ordering state agencies to begin transitioning their fleets away from internal combustion engines that depend on petroleum. The ultimate goal was to use zero emission vehicles that use no petroleum- based fuel. This project, in future years, will account for an estimated annual displacement of 1,800 gallons of gasoline and the reduction of 11 metric tons of GHG emissions.

- Expand level 2 residential EV charging, specifically in multi-unit dwellings.
 - One of the program goals was to provide cost effective EVSE installations while meeting CEC program requirements, including data reporting.

AV was awarded up to \$75,000 to supply and install EVSEs at each of two hotels in San Diego, California. AV and its electrical subcontractors installed eight EVSEs at two Extended Stay

² [California Department of Motor Vehicles](https://www.dmv.ca.gov/portal/) <https://www.dmv.ca.gov/portal/>

³ [California’s Global Warming Solutions Act 32](https://www3.arb.ca.gov/cc/ab32/ab32.htm) <https://www3.arb.ca.gov/cc/ab32/ab32.htm>

⁴ [Governor Brown’s Executive Order B-16-12](https://www.ca.gov/archive/gov39/2012/03/23/news17472/index.html)
<https://www.ca.gov/archive/gov39/2012/03/23/news17472/index.html>

America hotels (Fashion Valley and Hotel Circle). Both hotels were also meant to serve as charging sites for the Car2Go EV car sharing program.

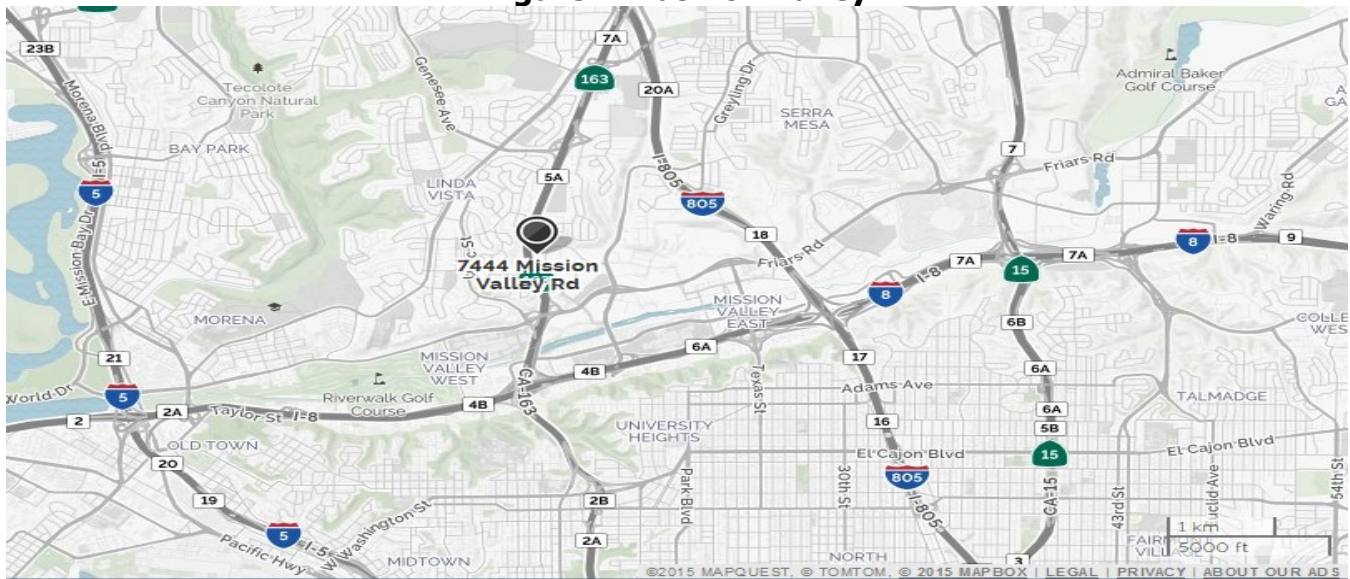
1.2 Project Planning and Approach

Car2Go, a subsidiary of Daimler AG⁵ provides car sharing services in European and North American cities. The company offers exclusively Smart For two vehicles, both pure EV and gasoline-powered, and features one-way point-to-point rentals. In San Diego, the 400-vehicle fleet was initially all electric, but in early 2016 Car2Go replaced these vehicles with gasoline-powered vehicles, so that Car2Go dropped their participation in the program.

Project planning began during the preparation of the proposal in response to PON-12-602. The solicitation limited single application awards to \$75K, which allowed for a modest scope for supply and installation of level 2 EVSEs at multi-unit dwellings. In the case of this project, funding allowed for installation at two hotels. An additional constraint was the fleet application portion. AV worked with Car2Go to determine eligible hotels that could serve their territory in the San Diego area. After the award, AV and Car2Go investigated the Young Men's Christian Association (YMCA) sites per the original plan. However, YMCA withdrew their participation from the program because of the requirement to allow non-member access (i.e., public charging and Car2Go operations). This necessitated amending the agreement to use hotel sites instead. After a relatively long search, AV and Car2Go then identified and qualified the two Extended Stay America hotel sites for the project.

The Extended Stay America Fashion Valley hotel, Figure 1, is located at 7444 Mission Valley Rd, San Diego 92108 and the Hotel Circle Hotel, Figure 2, is located at 2087 Hotel Circle South, San Diego, CA 92108. Below show the locations of the two sites.

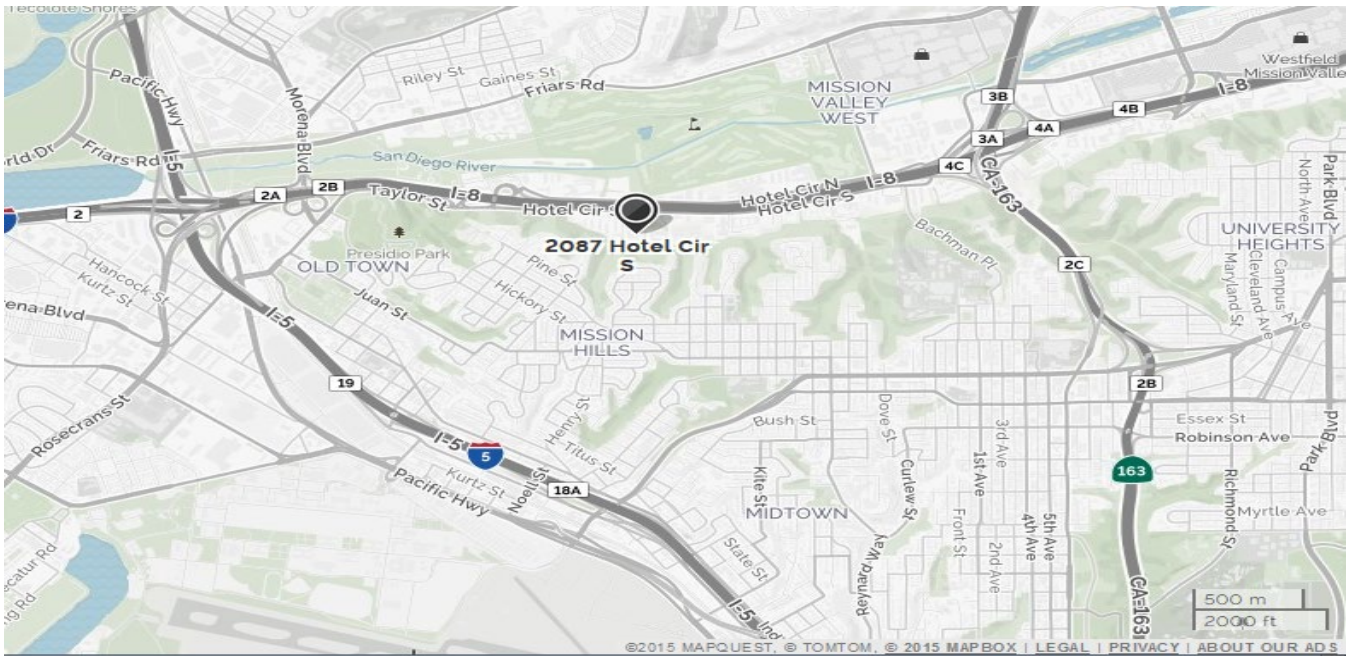
Figure 1: Fashion Valley



Source: [Mapquest](https://www.mapquest.com/us/ca/san-diego/92108-4406/7444-mission-valley-rd-32.778550,-) <https://www.mapquest.com/us/ca/san-diego/92108-4406/7444-mission-valley-rd-32.778550,->

Figure 2: Hotel Circle

⁵ [Daimler AG Premium Car Company](https://www.daimler.com/company/) <https://www.daimler.com/company/>



Source: [Mapquest](https://www.mapquest.com/us/california/extended-stay-america-san-diego-hotel-circle-11264279) <https://www.mapquest.com/us/california/extended-stay-america-san-diego-hotel-circle-11264279>

Process

AV worked with the management of Extended Stay America, acquired permits, and installed the EVSEs in December 2015 through January 2016. The EVSEs use Bluetooth/smart phone access control.

AV conducted the following process steps:

- Site Assessment
- Installer Confirmation
- Site Assessment Visit
- Order of Installation Services
- Permit Application*
- Permit Receipt
- Installation Service
- Final Inspection

*Permit costs were not eligible for funding as set by the CEC program requirements. These were paid by the site hosts.

For this project, working with one hotel management greatly simplified the process. In addition, Extended Stay America was very helpful in providing site access and providing timely data required for the permit process (E.g., electric bills).

CHAPTER 2:

Project Implementation

AV installed the EVSEs following the process listed in Chapter 1. Figures 3, 4, and 5 show pictures of the EVSE installations performed under this Project.

Figure 3: EVSE Installation at Extended Stay America – Fashion Valley



Source: [AeroVironment Inc. Charging Stations](https://www.avinc.com/) <https://www.avinc.com/>

Figure 4: EVSE Installation at Extended Stay America, Handicap Stall – Hotel Circle



Source: [AeroVironment Inc. Charging Stations](https://www.avinc.com/) <https://www.avinc.com/>

Figure 5: EVSE Installation at Extended Stay America, Standard Stalls – Hotel Circle



Source: [AeroVironment Inc. Charging Stations](https://www.avinc.com/) <https://www.avinc.com/>

2.1 Data Gathering

The program required that site hosts participate in data collection by providing information on kilowatt-hour usage, and number and duration of charging sessions.

2.2 Number of Vehicles Fueled

Initially, Car2Go planned to use the EVSEs as charging hubs for their service territory, which would have translated to very high EVSE utilization. With the change in their operations to gasoline-powered vehicles, only hotel guests and the public would now have EVSE access. Each hotel has four EVSE, which allows for typically four vehicles per day to charge. A 50 percent utilization rate is projected in the near future and 100 percent utilization rate long term. A 100 percent utilization rate would translate to 2,920 vehicles charged per year at the two hotels.

2.3 Number of Days Vehicles Fueled

EV are charged daily at the hotel's EVSE, 365 days a year.

2.4 Number of Charging Events

Based on the first six months of data, the number of annual charge events for the eight EVSE resulting from this project is approximately 50 to 100. This translates to approximately 500-1,000 kilowatt-hour annual usage, or approximately 3,300 equivalent miles traveled. This is a low utilization rate but expected when taking into account the charger startup operations at the hotels and the still low penetration of EV hotel travelers. Over the next several years, a projected 50 percent utilization rate, as noted above, would result in approximately 1500 annual charge events

2.5 Maximum Capacity of the New Fueling System

The level 2 EVSE installed under this project were rated at 16 amperes 208/240 alternating current Voltage. The maximum capacity at 240 alternating current Voltage is 3.8 kilowatt hours.

2.6 Gallons of Gasoline Displaced

Based on the first six months of data, the 3,300 equivalent miles the PEVs in this program travel will displace approximately 120 gallons of regular gasoline (when compared with a 2013 Nissan LEAF to a 2013 Chevrolet Impala using regular unleaded fuel, according to the [United States Department of Energy's website](https://fueleconomy.gov) <https://fueleconomy.gov>. With 1500 annual charge events in future years, this would translate to 52,000 equivalent miles traveled and approximately 1,800 gallons of gasoline displaced annually.

2.7 Emissions Reductions

Emissions reductions, as with gasoline displaced, were based on 3,300 annual PEV miles traveled for the first year and 52,000 miles for future years. The Greenhouse Gases, Regulated Emissions, and Energy Use in Transportation (GREET) model was used to calculate GHG, non-methane hydrocarbons, oxides of nitrogen, non-methane hydrocarbons plus oxides of nitrogen, particulates, and formaldehyde.

The GREET software was developed by Argonne National Laboratory. This analysis used the GREET version 1-2014 using standard inputs for California grid mix and California reformulated gasoline.

Emission Reduction Results

- Greenhouse gas (GHG) – 0.7 metric tons first year, 11 tons annually in future years
- Non-methane hydrocarbons (VOCs) – negligible for the first year and future years
- Oxides of nitrogen (NOx) – negligible for the first year and future years
- Non-methane hydrocarbons plus oxides of nitrogen (VOCs and NOx – negligible
- Particulates (PM₁₀ + PM_{2.5}) – negligible for the first year and future years
- Formaldehyde – negligible for the first year and future years

Figure 6: GREET 1-2014 Emission Factor
Electric Vehicle ICE Vehicle, Cal. Gasoline

Item	g/mile					g/mile			
	Feedstock	Fuel	Vehicle Operation	Total		Feedstock	Fuel	Vehicle Operation	Total
Total Energy	172	1,224	1,330	2,726		127	935	3,932	4,995
Fossil Fuels	169	948	1,030	2,147		121	854	3,670	4,645
Coal	2	126	136	264		3	19	0	22
Natural Gas	154	822	893	1,870		75	625	0	700
Petroleum	13	1	1	14		43	210	3,670	3,923
Water Consumption	0.01	1.18	0.00	1.20		0.07	0.19	0.00	0.25
CO ₂ (w/C in VOC & CO)	11	130	0	141		-12	61	302	350
CH ₄	0.312	0.011	0.000	0.323		0.319	0.234	0.011	0.563
N ₂ O	0.001	0.001	0.000	0.002		0.000	0.015	0.007	0.022
GHGs	21	131	0	152		-2	72	304	373
VOC: Total	0.017	0.005	0.000	0.022		0.012	0.108	0.170	0.290
CO: Total	0.042	0.060	0.000	0.102		0.026	0.072	2.866	2.963
NOx: Total	0.057	0.090	0.000	0.147		0.092	0.118	0.121	0.331
PM ₁₀ : Total	0.003	0.011	0.018	0.032		0.006	0.013	0.026	0.044
PM _{2.5} : Total	0.001	0.008	0.005	0.014		0.006	0.008	0.012	0.025
SOx: Total	0.022	0.088	0.000	0.110		0.045	0.105	0.005	0.154
BC Total	0.008	0.009	0.001	0.018		0.008	0.007	0.002	0.017
OC Total	0.000	0.002	0.001	0.003		0.002	0.002	0.006	0.010

Source: [Argonne National Laboratory](https://www.anl.gov/) <https://www.anl.gov/>

Sample Calculation: 1000 miles of EV travel equates to 152 gallons/miles x 1000mi = 0.152 metric tons 1000 miles of internal combustion engine (ICE) travel equates to 373 gallons/miles x 1000 = 0.373 metric tons GHG reduction = 0.373-0.152 = 0.221 metric tons/1000 miles

Formaldehyde Calculation

The GREET model does not list formaldehyde emissions. However, formaldehyde emissions were estimated using a factor of 20 percent of VOCs from the following study to calculate ICE vehicle portion:

Well-to-Wheels Analysis of Advanced Fuel/Vehicle Systems — A North American Study of Energy Use, Greenhouse Gas Emissions, and Criteria Pollutant Emissions

Brinkman, N., M. Wang, T. Weber, and T. Darlington, May 2005

Formaldehyde for the EV portion is a subset of VOC. However, this is a small number relative to the ICE vehicle emissions. Thus, the VOC emissions were assumed to represent formaldehyde emissions.

Formaldehyde = 0.29 x 0.2 ICE – 0.022 = 0.036 grams/milliliters

2.8 Duty Cycle

Based on the first six months of data for the two hotels, the EVSEs are used about once per week. This usage is projected to increase dramatically in future years to approximately once per day.

2.9 Jobs and Economic Development

EV and EVSE manufacturing creates jobs. The installations have, at the minimum, provided temporary jobs and have contributed to increasing revenues for companies engaged in the manufacture and installations of EVSEs. This project resulted in \$33,000 or 44 percent of grant funding, to be paid to two in-state local electrical contractors. These contractors are small businesses.

Electrification of personal transportation can push job creation in a host of industries. More efficient cars require more sophisticated technology, which are designed and produced by adding workers to the auto industry. Many of these jobs would be in industrial sectors closely tied to auto manufacturing, advanced batteries, and research and development.

In the long run, drivers who switch to electric vehicles will have more disposable income to spend on housing, entertainment, and other services. This increased spending in other sectors will stimulate the economy and enhance job creation.

2.10 Renewable Energy at the Facility

Neither hotel in this project has renewable energy sources installed.

2.11 Source of the Alternative Fuel

The electrical power for the charging stations was provided by San Diego Gas & Electric. Based on 2013 data from the US Energy Information Administration⁶, in California, 60 percent of electricity generated comes from natural gas, 12 percent from hydroelectric, and 9 percent

⁶ [US Energy Information Administration Website](https://www.eia.gov/electricity/monthly/epm_table_grapher.php?t=epmt_1_01_a)

https://www.eia.gov/electricity/monthly/epm_table_grapher.php?t=epmt_1_01_a

from nuclear. Wind and geothermal each account for 7 percent. Biomass and solar represent 3 percent and 2 percent, respectively.

2.12 Energy Efficiency Measures

Although the project did not track energy efficiency measures at the hotels, electric utility customers now benefit from rate plans to help manage EV energy costs. San Diego Gas & Electric has an electric vehicle time-of-use rate which is lower during off-peak hours, between midnight and 5 AM. electric vehicle time-of-use rates encourage cutting down on daytime usage of electricity, when demand is at the highest.

CHAPTER 3:

Assessment of Project Success

Electric vehicles produce less tailpipe emissions per mile than conventional vehicles, even taking into account power-plant emissions. These vehicles contribute to a cleaner commute and lower carbon footprint. Plug-in electric cars are more efficient and require less energy to operate than internal combustion engine vehicles.

Electric vehicles contribute to energy independence. Most of the resources used to power our grid are locally sourced, with approximately 20-percent of the power generated from renewable energy sources like wind and solar. When an EV driver fuels his vehicle, he is purchasing 100-percent American-made energy instead of the imported oil that powers most conventional vehicles today.

Electric cars lower fuel expenses compared to gasoline. On average, electricity costs 25-percent to 50-percent the cost of a gasoline gallon equivalent. The user household may save more by choosing an electric vehicle rate plan that gives lower rates for charging at night, when the costs of electricity are lower.

Aside from contributing to widening the network of EVSE infrastructure and expanding level 2 EV charging in multi-unit dwellings, this project will contribute to an annual displacement of approximately 1,800 gallons of gasoline and reducing GHG emissions by an estimated 11-metric tons.

This project complements a host of other projects by federal and local governments to expand EV charging infrastructure for fleets and residences in the City of San Diego.

California's per capita energy consumption ranks at 48th in the nation. The state's low use of energy was due in part to its mild climate and programs promoting alternative energy use.

CHAPTER 4:

Conclusion and Recommendations

4.1 Conclusion

Installing electric vehicle charging stations in its parking facilities is another important step in the hotel industry's initiative to promote a cleaner and greener environment. Hotels have promoted water conservation through its laundry practices and many now get their power from solar and other renewable energy sources. Making EVSEs available is a logical next step.

According to Jordan Ramer, Chief Executive Officer of EV Connect, "the benefits for hotels of having EVSEs are:

- Boost guest satisfaction
- Increase occupancy rate and/or visitations
- Differentiate hotel from competitors
- Increase revenue per available room (boost receipts of bar/lounge/restaurant/spa)
- Enhance and promote a positive brand image."⁷

This project achieved its goal of promoting the adoption of plug-in electric vehicles in multi-unit dwellings, by expanding level 2 charging in the hotel and fleet vehicle sectors. It contributed to the electrification of the transportation sector, will reduce GHG emissions by approximately 11-metric tons annually, and is projected to displace an estimated 1,800 gallons per year of gasoline. The project contributed to small business job creation with 44-percent of grant funds going to two California electrical contractors and also provided a boost to EV charging infrastructure in the City of San Diego.

4.2 Recommendations

It was observed that many hotels are still reluctant to make EV charging available for their guests and employees. In the search for a site host, the reasons usually given for this reluctance were limited parking spaces, management and maintenance costs, and the public access requirement.

This project makes a good case for promoting electric vehicle adoption by making level 2 charging available. It showed that the process of procuring and installing EVSE is seamless and convenient, when handled by a professional company who is an expert in this field. Additional funding and incentives for similar projects in multi-unit dwellings, specifically hotels, is recommended.

⁷ [Jordan Ramer, "EV Charging at Hotels Delivers Competitive Advantage and Boosts Revenue", 2013, p. 1.](https://www.evconnect.com/blog/ev-connect-and-general-motors-to-enhance-charging-experience/)
<https://www.evconnect.com/blog/ev-connect-and-general-motors-to-enhance-charging-experience/>

Glossary

AEROVIRONMENT INC. (AV)—At AeroVironment, our purpose is to secure lives and advance sustainability through transformative innovation. Our solutions give our customers a fresh vantage point, positioning them to see the world with new eyes and extending their reach beyond the line of sight. That is the power of our breakthrough unmanned aircraft systems, perfected and refined over a half century.⁸

CALIFORNIA ENERGY COMMISSION (CEC)—The state agency established by the Warren-Alquist State Energy Resources Conservation and Development Act in 1974 (Public Resources Code, Sections 25000 et seq.) responsible for energy policy. The CEC's five major areas of responsibilities are:

1. Forecasting future statewide energy needs.
2. Licensing power plants sufficient to meet those needs.
3. Promoting energy conservation and efficiency measures.
4. Developing renewable and alternative energy resources, including providing assistance to develop clean transportation fuels.
5. Planning for and directing state response to energy emergencies.

Funding for the CEC's activities comes from the Energy Resources Program Account, Federal Petroleum Violation Escrow Account, and other sources.

ELECTRIC VEHICLE (EV)—A broad category that includes all vehicles that are fully powered by electricity or an electric motor.

ELECTRIC VEHICLE SUPPLY EQUIPMENT (EVSE)—Infrastructure designed to supply power to EV. EVSE can charge a wide variety of EV, including BEVs and Plug-in Hybrid Electric Vehicles.

GREENHOUSE GAS (GHG)—Any gas that absorbs infrared radiation in the atmosphere. Greenhouse gases include water vapor, carbon dioxide (CO₂), methane (CH₄), nitrous oxide (NO_x), halogenated fluorocarbons (HCFCs), ozone (O₃), per fluorinated carbons (PFCs), and hydrofluorocarbons (HFCs).

GREENHOUSE GASES, REGULATED EMISSIONS, AND ENERGY USE IN TRANSPORTATION (GREET®)—A full lifecycle model sponsored by the Argonne National Laboratory (U.S. Department of Energy's Office of Energy Efficiency and Renewable Energy). GREET® fully evaluates energy and emission impacts of advanced and new transportation fuels, the fuel cycle from well to wheel, and the vehicle cycle through material recovery and vehicle disposal. It allows researchers and analysts to evaluate various vehicle and fuel combinations on a full fuel-cycle/vehicle-cycle basis.

⁸ [Aerovironment Inc. https://www.avinc.com/about](https://www.avinc.com/about)

INTERNAL COMBUSTION ENGINE (ICE)—The ignition and combustion of the fuel occurs within the engine itself. The engine then partially converts the energy from the combustion to work. Plug-in Electric Vehicle (PEV).

NITROGEN OXIDES (OXIDES OF NITROGEN, NO_x)—A general term pertaining to compounds of nitric oxide (NO), nitrogen dioxide (NO₂), and other oxides of nitrogen. Nitrogen oxides are typically created during combustion processes and are major contributors to smog formation and acid deposition. NO₂ is a criteria air pollutant and may result in numerous adverse health effects.

PARTICULATE MATTER (PM)—Unburned fuel particles that form smoke or soot and stick to lung tissue when inhaled. A chief component of exhaust emissions from heavy-duty diesel engines.

VOLATILE ORGANIC COMPOUNDS (VOCs)—Carbon-containing compounds that evaporate into the air (with a few exceptions). VOCs contribute to the formation of smog and/or may themselves be toxic. VOCs often have an odor and some examples include gasoline, alcohol and the solvents used in paints.

YOUNG MEN'S CHRISTIAN ASSOCIATION (YMCA)— is one of the oldest and largest Movements for youth in the world. Founded in 1844, it now operates in 119 countries, and reaching 58 million people. The YMCA works to bring social justice and peace to young people and their communities, regardless of religion, race, gender or culture.⁹

⁹ [YMCA](https://www.ymca.int/who-we-are/) <https://www.ymca.int/who-we-are/>